Evolution and Human Behavior 47 (2026) 106832

Contents lists available at ScienceDirect

Evolution and Human Behavior

journal homepage: www.elsevier.com/locate/ens

Existential security and the cultural evolution of secularisation in Mauritius

Nachita Rosun [a,b,*], Matthew M. Gervais [a], Aiyana K. Willard [a]

[a] Brunel University of London, College of Health, Medicine, and Life Sciences, Psychology Division, Centre for Culture and Evolution, United Kingdom
[b] Oxford Brookes University, Faculty of Health and Life Sciences, Centre for Psychological Research, Oxford, United Kingdom

ARTICLE INFO

Keywords:
Cultural evolution
Religion
Psychology
Cultural change
Secularisation
Cultural transmission
Credibility enhancing displays

ABSTRACT

Despite the central role of religion in human history and its continued global growth, an increasing number of individuals identify as secular or atheist across many parts of the world. Several evolutionary, social, and economic theories attempt to explain this process of decline, but most empirical tests of these theories focus on post-industrial, primarily Christian countries in the Global North. This study widens the comparative lens within a cultural evolutionary framework: we test two theories of religious change, the existential insecurity hypothesis and cultural transmission models of religion, among three religious communities (Chrisitan, Hindu, Muslim) in the rapidly transitioning population of Mauritius. Contrary to theoretical accounts, existential security variables such as neighbourhood quality, household material security, and years of education have no consistent main effect on individual religious belief and practice. Perceived valuation of education by one's religious community bolsters individual religiosity, while perceived family valuation of education reduces belief. Exposure to religious displays (CREDs) from family members positively predicts individual religious belief and practices, however household material security influences these effects: exposure to religious displays is more influential at higher levels of material security, and at low levels of security, religiosity is relatively stable. This suggests that religious socialisation within the family is critical to the transmission of religion among those with high material security. These results demonstrate how the cultural evolutionary processes that give rise to religion may be sensitive to socioecological pressures.

1. Introduction

Religious beliefs and institutions have been a central part of human culture across most of our species' history. Across cultures, the expression of religion is shaped by local contexts (Purzycki, 2011; Singh et al., 2021), and changes over time alongside socio-ecological changes (Norenzayan et al., 2016; Purzycki and Sosis, 2022). In recent years in the socio-ecological context of the Global North, religious change has taken the form of declining religiosity and religious identification (Kasselstrand et al., 2023; Pew Research Center, 2016).

Theories of secularisation (e.g., Bruce, 2002; Kasselstrand et al., 2023; Norris and Inglehart, 2011) explain religious decline by focusing on modernisation and the socio-economic changes often associated with it. Secularisation theories broadly suggest that as societies create secular infrastructures for individuals to rely on they become less involved with, or reliant on religion. This leads to the loss of significance of religion in people's daily lives, and over time the larger scale decline of religion at a national or cultural level. If we re-frame this idea with cultural evolutionary theory, it suggests that the adaptive function of religion declines when other institutions take over many of religion's previous societal and explanatory roles.We can add to theories of social-transmission which have previously been shown as the strongest predictors of religious decline (Maij et al., 2017; Turpin and Willard, 2022; Willard and Cingl, 2017). Rather than offering competing explanations, these theories could work together: while secularisation theories focus on changing ecologies, cultural transmission highlights the role of social learning in keeping religion stable, but changing ecologies may influence how much religious socialisation one is exposed to and thus how well religion is transmitted. Together, these theories can provide a more comprehensive explanation of how religion is changing.

Currently, most theories of religious decline have been developed with western, developed samples although they are presumed to be universally applicable. If this is really the case, these processes should replicate across cultural settings. One of the ways to test these theories, and expand their explanatory scope, is to look at them in transitioning cultures where these economic and social changes are relatively new.

* Corresponding author at: Brunel University of London, College of Health, Medicine, and Life Sciences, Psychology Division, Centre for Culture and Evolution, United States of America.
E-mail address: nrosun@brookes.ac.uk (N. Rosun).

https://doi.org/10.1016/j.evolhumbehav.2026.106832
Received 15 September 2025; Received in revised form 10 January 2026; Accepted 16 January 2026
Available online 5 February 2026

This paper tests and combines theories of secularisation and cultural evolution by applying them to a novel setting of religious decline: the island nation of Mauritius. Mauritius contains a religiously plural population undergoing rapid economic development and modernisation. By looking at this decline phenomena in a country undergoing rapid economic and demographic changes, we can potentially test these theories at early stages of this process and see if they extend outside of western Christian traditions.

1.1. Secularisation theory

Secularisation theory refers to a set of theories which posit that the modernisation of societies will inevitably lead to secularisation. This model of religious decline has had several proponents such as Karl Marx (1843), Weber (1946), and Durkheim (1912), with slight variations in the proposed process underlying secularisation. Examples of these intricate mechanisms are: 1) education and the adoption of rational sciences will lead to individuals' preference of scientific and rational explanations over supernatural ones (Bruce, 2011, 2017; Hirschle, 2013), 2) strong secular institutions that that serve similar purposes as religious ones (meaning-making, anxiety reduction, risk management, and improving quality of life) will lead to abandoning religion (Norris and Inglehart, 2011), and 3) the increase of exposure to different beliefs or religious pluralism will lead to the belief that religious worldviews are implausible (Berger, 1967).Thus, modernisation creates an environment characterised by disenchantment of religious beliefs, rationalisation and secular alternatives which together contribute to a decline in the significance of religious institutions in the world (Kasselstrand et al., 2023). This decline has become more pronounced over the last decades which has been seen as support for these ideas (Kasselstrand et al., 2023).

Though the hard form of secularisation theory - that this process will inevitably lead to the complete abandonment of religion – is largely rejected in light of the continued growth of religion worldwide, (see Stark, 1999; Finke & Stark, 2005), many of the coremechanisms of religious decline are still widely applicable today (Kasselstrand et al., 2023). Within this broader secularisation literature, we focus on the role of existential security and education which are especially relevant factors within the Mauritian context.

1.1.1. Existential security hypothesis

The existential insecurity hypothesis is a secularisation theory that suggests thatthe increased financial, political, and social security which accompanies modernisationleads to religious decline (Norris and Inglehart, 2011). This theory is rooted in the idea that religious belief helps people cope with existential insecurities that arise from fears of illness, death, and destitution. Thus, religiosity of a society should vary with the level of existential security that society offers. Specifically, poorer societies with weak secular institutions should have higher religiosity than those where many of the everyday existential fears have been removed by wealth, welfare, healthcare and other secular institutions. As the comfort and support religion offers to people is replaced by other securities and institutions, religion becomes less important to the people within that society.This idea is further supported by empirical work highlighting increased religiosity when populations face adversity such as war (Henrich et al., 2019),droughts (Hong et al., 2024), or natural disasters (Sibley and Bulbulia, 2012). Relatedly, religiosity decreases in places with higher average country levels of wealth (Storm, 2017), lower wealth inequality (Norris and Inglehart, 2011) and lower local levels of unemployment (Willard and Cingl, 2017). Relevant to our research, processes such as economic development and education improve existential security. These infrastructures increase access to food, homes, healthcare, and other facilities (Strhan and Shillitoe, 2019).

However, this research has not always replicated cross-culturally. Various factors influence the relationship between economic development and religiosity, such as historical wealth, political background, and religious identification of the population (Kusano and Jami, 2022). Ireland, for example, has largely avoided the secularisation trend of its European neighbours because of the strong ethnic identification with the Catholic Church (Turpin, 2022). Much of the recent trend to secularisation here has been driven by church scandal rather than increased economic security (Turpin et al., 2019; Turpin and Willard, 2022).It is important to note that although the existential insecurity hypothesis is a theory that describes psychological processes, i.e., existential insecurity experienced at the individual level, most empirical work has set out to test this relationship at the societal level. This distinction has previously also been highlighted by other researchers (Baimel et al., 2022; Purzycki et al., 2018). When looking at the individual level across more cultural settings (including small-scale and transitioning societies), research has found that security influences how, rather than how much, individuals practice religion (Baimel et al., 2022). More evidence is needed from diverse social settings to better understand how existential security interacts with religiosity. As a young country undergoing high-paced economic change in the past 50 years, Mauritius offers an interesting test case for exploring the effects of changes in existential security through wealth and secular institutions on religion.

1.1.2. Education

Education is another aspect of modernisation highlighted by the existential insecurity hypothesis as well as broader secularisation theorists (Braun, 2012). Education can increase individual material security as higher levels of education may lead to better employment and salary which in turn helps people access everyday comforts and luxuries. Education may additionally contribute to religious decline by equipping individuals with alternative worldviews, encouraging the reliance on other ways of making sense of the world (e.g., science) instead of supernatural belief (Berger, 1967). Across various post-industrial societies, educational institutions have separated themselves from religious ones to instead focus on the training of individuals to become contributing members of society (Kasselstrand et al., 2023). This means that the focus of schools tends to be secular, with minimal religious transmission and a larger focus on critical thinking skills (Purzycki and Bendixen, 2024). This may create a tendency tofavour more scientific beliefs over religious ones, thus contributing to a decline in religion.

However, the empirical research on education and religion suggests more nuance. While some find a negative effect of education on religion across nations (Hungerman, 2014; Norris and Inglehart, 2011; Inglehart, 2020; Schwadel, 2015, 2016), others suggest substantial differences in this effect across nations (Pew Research Center, 2016; Purzycki and Bendixen, 2024). Simultaneously, the effects of education on religiosity varies within nations: although in the US those with a higher education tend to be less religious, this difference is not found among Christians (Pew Research Center, 2022). In Mauritius, education has grown increasingly accessible since the country's independence in 1968. As the country contains individuals of various religious backgrounds exposed similarly to schooling within each group with similar differences in average level of education across generations (i.e., older people in every group may have only 8 years of formal education were younger have a university degree), we can simultaneously explore differences in the education-religion link across religious groups.

1.2. Why religion persists

Cultural evolution theories of religion, as well as cultural evolution theories more generally, focus on the selective transmission and spread of cultural information (Gervais et al., 2011; Henrich, 2015; Richerson and Boyd, 2004). Essentially, these theories seek to explain changing frequencies in cultural traits over time. Much of this work is focused on the context of transmission, such as when peopleare prone to learn something and who they tend to learn from (Mesoudi, 2021). Much of the work on the cultural evolution of religion has focused on how different ecologies can lead to different types of religious belief. Most of

this work has looked at how different beliefs enforce different norms across different social ecologies (Purzycki, 2013; Purzycki and Sosis, 2022; Singh et al., 2021; Willard et al., 2024), but this concept can easily be extended to encompass religious decline as a result of increased wealth and security from secular institutions (Willard and Cingl, 2017). To understand how this might work, we first need to understand religious socialisation and how social learning biases might influence belief.

1.2.1. Socialisation and the spread of religion

The prevalence of religious traits in an individual's broader cultural environment influences the spread of religion through a variety of social learning biases (Henrich, 2015)– children growing up in a Muslim setting are likely to become Muslim, and children growing up in a Hindu setting are likely to become Hindu. Biases, like kin-based transmission, (learning through parents and family), have been invoked to emphasise the role of religious socialisation within the family and its importance for the persistence of religion over generations (Gervais and Najle, 2015; Lanman and Buhrmester, 2017; Voas & Storm, 2021). This work has emphasized the specific bias towards learning from credibility enhancing displays (CREDs; Henrich, 2009), specifically emphasising the exposure to the religious practices of family members.

1.2.2. Credibility enhancing displays

CREDs are behaviours used by learners to reliably index a model's true belief in something that is otherwise hard to assess. Unlike verbal expressions of belief, these behaviours have an associated cost that would seem unnecessary or even outrageous if the stated belief and benefit of that belief were not believed true. For example, participating in a gruelling and painful pilgrimage would seem ridiculous if you did not believe in spiritual and religious beliefs behind such a ritual (Xygalatas et al., 2016). This associated cost suggests that you are not being deceptive about your beliefs and are a reliable person to learn from. True believers are likely to engage, often repeatedly, in these signals in order to display their commitment to the belief. Hence, attending to others' credible behaviours can help learners evaluate individuals' commitments to a belief system, the importance of that belief within their society, and the importance of adopting such a belief themselves.

Though conceived of as a general cultural learning bias (Henrich, 2009), CREDs has mostly been tested in the domain of religion (Gervais et al., 2021; Lanman and Buhrmester, 2017; Turpin and Willard, 2022; Willard and Cingl, 2017). Individuals' religious beliefs are hard to estimate from verbal cues alone. Thus when these beliefs are associated with credible displays, like costly ritual participation, they are perceived as more likely to be true beliefs and thus are more likely to be adopted by learners. This, in turn, increases the likelihood these beliefs and practices spread and become widespread religious beliefs. Exposure to religious credibility enhancing displays (e.g., by observing parents going to church regularly, tithing or performing other sacrifices for their religion), are consistent predictors of religiosity across individuals (Gervais et al., 2021; Ishii and Watanabe, 2024; Łowicki and Zajenkowski, 2020; Maij et al., 2017; Willard and Cingl, 2017).

1.3. Existential security and the cultural evolution of secularisation

The theories we describe propose different explanations for religious change. Existential insecurity hypothesis posits that socioecological changes associated with modernisation, such as improved material security, quality of life, and formal education have secularisation effects (Fig. 1a).

These increases in existential security have been associated with a decrease in religious *behaviours* (Norris and Inglehart, 2011; Storm, 2017). As CREDs consist of costly religious signals, which are inherently religious behaviours, this suggests that increasing existential security also leads to a decline in CREDs exposure (Fig. 1b).

On the other hand, cultural evolutionary accounts of religion highlights the role of socialisation and cultural transmission processes in sustaining religious traditions (Fig. 1c). This suggests that CREDs may act as protective factors against secularisation effects.

Thus, religious traditions with higher CREDs should be more likely to resist the secularisation pressures of material security and education as the cultural transmission of religion is preserved (Turpin, 2022; Turpin and Willard, 2022).This implies an interaction between these two theories where the effects of these two processes on religion are conditional on one another (Fig. 1d).

Empirically testing and integrating these theories would require data that simultaneously captures variation in 1) existential security, which could be measured in terms of access to resources which increase material security (e.g., neighbourhood quality and material assets), 2) religious socialisation, including exposure to costly displays and other forms of religious schooling from family and communities, and 3) religious belief and practice. Mauritius, a modernised yet religiously diverse society, offers a sample with these diverse characteristics. Despite being a developed country, there is still variation in material security among Mauritians. The degree of religious socialisation varies as a function of group differences (some religions are more CREDs intensive) as well as individual differences.Hence, Mauritius offers a particularly informative population for understanding how modernisation and cultural transmission together shape patterns of religious change.

1.4. Ethnographic background

1.4.1. Religious landscape

Mauritius is a small island nation about 2000 km off the east coast of Madagascar. The island contains a population where religion is plural and highly normative. The religious communities include Christians (23%), Hindus (40%), Muslims (19%), Buddhists, Baha'is, among others (Statistics Mauritius, 2022). The island is constitutionally secular, but practices a strong multicultural approach to religious tolerance. The various communities interact daily with one another, and freedom of religious practice is encouraged. Amidst the high rate of intergroup contact, religion is a salient identity marker which creates group boundaries through norms for the ingroup (e.g, prayers, rituals, food taboos) and for interacting with outgroups (e.g., close friendships with outgroup members are widespread but romantic relationships across

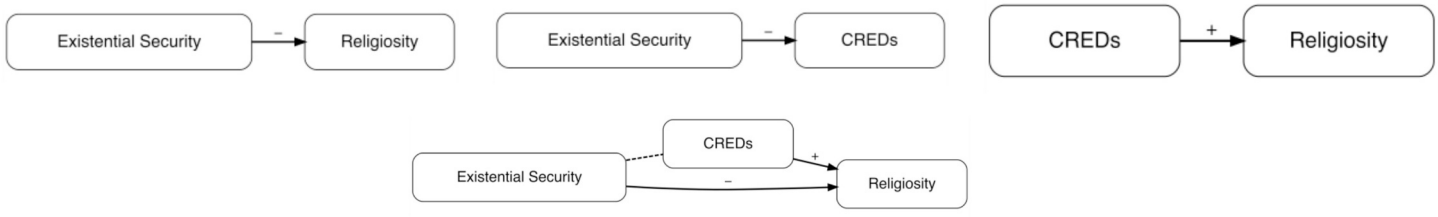

Fig. 1. a: Existential insecurity - religiosity hypotheses.
b: Existential Insecurity – CREDs.
c: Cultural Evolutionary Theory.
d: Existential Insecurity & Cultural Evolutionary Model.

religious boundaries are frowned upon; Ng Tseung-Wong and Verkuyten, 2014).

The physical landscape is equally reflective of the pervasive religious plurality: several churches, temples, and mosques can be found, often neighbouring each other, in every town and village. The call for prayers from mosques can be heard 5 times a day, every day, and the chiming of bells from churches and temples are frequent. The island's multicultural policy further contributes to the centrality of religion, with public holidays catering to at least one of the largest celebrations of each religious community, such as Easter, Diwali, and Eid. These festivities are publicly celebrated (see Mano and Xygalatas, 2022 for a description of various Hindu celebrations), and although it is unusual for members of other religious communities to participate in rituals, sharing food on some of these occasions is not unusual. Thus, religious plurality and ritual celebration are central components of Mauritian culture.

While religiosity remains normative, non-belief appears to be subtly, yet steadily on the rise. This can be observed through small but growing numbers of Mauritians with 'no religious affiliation' (from 0.3% in 1990 to 0.6% in 2022; Statistics Mauritius;, 1990, 2022). This is likely to be an underestimate of the non-believers, because religion is treated as a group identity marker outside of belief (e.g. you are Hindu because your family is Hindu regardless of your actual belief), and because there is a taboo around being a non-believer. In support of this, in the last few years (2019–2024), we have found a growing number of online communities for non-believers, as well as declining average religiosity of samples we have collected in Mauritius.

As is true in many religious contexts (see Bengtson, 2013), across Mauritian Christian, Hindu, and Muslim communities, religious socialisation initially occurs at home through observing and interacting with parents and other family members. Individuals are exposed to various religious credibility enhancing displays such as praying and other rituals from their various caregivers during childhood, but the close-knit living arrangements ensure consistent exposure to CREDs from these close family members throughout the lifetime. Alongside home socialisation, the highly religious landscape of Mauritius creates space for social learning from community members during group prayers and public religious celebrations. However, cross-religion ritual exposure is very common, and ritual participation can take multiple forms (e.g., observation, or different degrees of participation such as praying at home vs going on a pilgrimage). This makes it difficult to understand the effect of community ritual exposure and participation as a cultural transmission process in the context. Instead, we turn to religious socialisation in more formal settings, a common practice which takes the form of after-school religious lessons in classrooms, as a measure of religious socialisation from the larger community.

1.4.2. Economic development in Mauritius

This atmosphere of plural religiosity persists against the backdrop of fast paced development. Since its independence in 1968, Mauritius has rapidly diversified its economy from agricultural based to include tourism, tech, and finance. The country has a human development index of 0.796 (UNDP, 2024), putting it in the 'highly developed' category. Development is not uniformly distributed across the island and the quality of life varies across neighbourhoods, for example in terms of the conditions of local infrastructures (e.g., roads, streetlights, buildings) or access to services (e.g., public transport, hospitals). This variation can be observed in terms of broad regions: the northern parts of the island tend to be more developed and are better connected; as are larger towns. Further variation exists within specific neighbourhoods - for example, the renowned tourist area of Le Morne simultaneously contains luxurious holiday homes, hotels and restaurants; and one of the poorest residential areas on the island. Nonetheless, beyond geographical variation in development, the population benefits from various facilities such as free public healthcare (and accessible private healthcare), as well as reasonable benefits for the unemployed, widowed, and retired such as stipends and free public transport.

1.4.3. Education in Mauritius

As most of this development occurred in the last few decades, beyond regional differences, there exists intergenerational differences in exposure to these facilities. This is most obvious in education. Education is highly valued by Mauritians, and commonly described as 'the pillar of the nation's success'. This can be observed through governmental facilities as well as the population's broad sentiments towards formal education. Since the 1940s, the Mauritian government has been committed to making higher levels of education accessible by making education compulsory until age 16, and free up to the undergraduate level. As the process of providing free education was staggered (i.e primary education [six years] became free in the 1940s, secondary [additional five years] in 1977, and full time undergraduate degrees at the University of Mauritius in 1988,) there are strong intergenerational differences in educational access. The increased access to education led to a substantial increase in the literacy rate of the population and created new opportunities for the diversification of the Mauritian economy from agrarian based to include tourism, tech and finance, and increased social mobility. Due to its role in facilitating social mobility, formal schooling is often highly valued, with some families saving and investing large amounts of money into sending children to universities abroad to increasetheir access to better jobs.

If modernisation, by decreasing existential insecurity, does lead to a decline in religiosity as is suggested by the existential security theory, we should expect to see significant age-based effects in this population as a result of the fast-paced development and increased access to education. Additionally, variation in neighbourhood quality, which implies higher levels of existential insecurity in some areas compared to others, should also have effects on individuals' religiosity.

1.5. The current study

This paper aims to test and integrate two theories of religious change: the existential insecurity hypothesis andcultural evolutionary accounts. We test these explanations in the novel cultural setting of Mauritius where processes of modernisation and religious socialisation are especially salient.This paper can shape how we understand the effects of rapid economic and educational development on non-Western, non-Christian majority samples and examine how these theorised effects might impact a population that is nearer to the beginning of a potential secularisation process. Additionally, we are interested in howincreased existential security and changes in religious socialisation might work together to influence religious decline. Following from the theoretical frameworks outlined above, our main hypotheses are:

1. High material security (measured throughpast and current neighbourhood quality, and current household material security) will predict lower participation in religion and lower belief.
2. High formal education will predict lower participation in religion and lower belief.
3. Low CREDs exposure will predict low belief and lower participation.
4. Religious schooling will not have a strong effect separate from CREDs.

In testing how changes in the socio-economic environment might impact religious socialisation we predict that:

5. Higher material security in childhood and adulthood will predict lower exposure to CREDs.

2. Methodology

2.1. Participants

Local research assistants recruited a convenience sample of 1051 participants across various public spaces in Mauritius such as bus and

metro stations, markets, beaches, and malls for face to face interviews. We selected spaces, such as the city centre or bus station of the capital Port-Louis, which have footfall from individuals from across the island (see SM1). We aimed to have a geographically representative sample as we were interested in neighbourhood-level factors. We approached participants at random and recruited Mauritians aged 18 and over, and from all religious identifications.In this study, we only include participants who identify as men or women (excluding 11NAs, 1 Other), and those of Christian, Hindu, and Muslim backgrounds (excluding 48 Tamils, 32 Telegus, 15 Marathis, 3 Buddhists, 37 other 8 NA), resulting in a sample of 873 participants. More details about the sample can be found in Table 1.

2.2. Measures

All the material used in this study can be found at https://osf.io/rfjkp/. The supplementary material (SM2) contains a shortened version with only measures used in this paper.This paper focuses on variables related to education, household economic security, neighbourhood quality, CREDs from close family, and religious belief and practice as outcomes.

2.2.1. Household material security

As it is customary for Mauritians to live in extended families and not acceptable to ask about income directly (Willard et al., 2024), we look at material security through facilities available to the household. We asked participants how many of various 'common items' they own. These items included houses, stove/ovens (the local language uses the same term for both), fridge, washing machine, laptops/computers, motorbikes, and cars. The extent to which these items contribute toindividuals' quality of life differs from their monetary value. To determine the weight of each item, we consulted 10 locals about how valuable each of these items are in everyday life. They were asked to discuss how owning each item contributes to an individual's quality of life, and they assigned weights using a scale of 1 (not valuable for daily life) to 5 (very valuable for daily life). This ensured that the scores assigned were reflective of local realities. Here, the items and assigned weights were house (5), oven/stove (3), washing machine (3), refrigerator (3), computer/laptop (2), car (2), motorbike (1). More detail about this informant-rating process can be found in the supplementary material (SM2a). For each participant in the larger dataset, we computed a composite wealth score as the standardised sum of the weights of all items they reported owning.

2.2.2. Education

Education was measured as a categorical variable: primary education (6 years of formal education), lower secondary (10 years of formal education), additional secondary education (11 years), finishing secondary school (13 years), diploma (14 years), undergraduate (16 years), master's (18 years) and PhD (21 years). In our analyses, we treat education level as a continuous variable by converting each education level to their respective number of years of formal education. Analyses with education level as categorical can be found in the supplementary material. We include two exploratory variables measuring self-reported importance of education for 1) the participant's family, and 2) the participant's religious community. These items give us insight into norms around formal education for individuals across communities.

Table 1
Descriptive table.

	Total	Male	Female	Mean Age	Mean Years of Education	Household Material Security
Christian	239	111	128	37.53	11.41	21.28
Hindu	421	198	223	36.38	12.57	23.20
Muslim	213	108	105	36.18	12.55	24.46

2.2.3. CREDs

We include the Lanman and Buhrmester (2017) credibility enhancing displays scale. As there is no Mauritian Creole term for 'caregiver', we used 'close family' as they are the ones involved in both the general and religious socialisation of children. Participants were asked to report their overall exposure to these CREDs instead of their exposure during childhood. This tells us about exposure toreligious behaviours in individuals' current circumstances and how current norms of religiosity contribute to the maintenance of religious beliefs and practices.

2.2.4. Religious schooling

Participants were asked how long their 1) in-person and 2) online religious schooling lasted. Religious schooling was defined to participants as any activity focused on the transmission of their religious beliefs and practices in a setting that is closer to a classroom instead of one-to-one with parents. In the case of online schooling this included both online classes and directed research that the participant has chosen to consistently engage with.

2.2.5. Religious belief and practice

Wetreat religious belief and religious practice as separate outcome variables (see Willard and Cingl, 2017). Our measure of religious belief includes 6 items measured on 7-point likert scales. These items look at belief in god, belief in prayer, doubts about the existence of god and efficacy of prayers, as well as the frequency of doubts in god and prayer efficacy. We used a religion-neutral term for god; 'Bon Dieu' which is the commonly used word across all groups. Our measure of religious practice included 3 items measured on a 7-point likert scale, which ask about frequency of prayer at home, in religious spaces (churches, temples, and mosques), and participation in larger religious celebrations. SM2d contains a discussion about the applicability of these items across religious communities.

2.2.6. Calculating neighbourhood ratings

Participants were asked the locality of where they currently live, as well as where they lived prior to their last move. Most participants (72.12%) had not moved from the neighbourhood they were born in. We created two neighbourhood quality scores by separately asking 100 participants to rate several localities based on their perception of the facilities available in that locality 1) currently (2024) and 2) 10 years ago (2014). We decided on a rating of 10 years ago as this could capture the rapid development on the island while ensuring that most participants are able to provide an accurate response. Participants were recruited in public spaces, and were only asked to rate localities in their general geographical area which we split up into North, South, East, West, and the larger towns/cities on the island (Port-Louis, Beau-Bassin/Rose-Hill, Quatre-Bornes, Vacoas/Phoenix, Curepipe). Due to data collection constraints, we only included 139 localities which appeared in the primary dataset more than two times. Hence, there are 77 non-random missing data points for our two neighbourhood quality measures (see SM2e for more information). We find reasonable variation in both measures (current neighbourhood quality range -1.86 to $+2.02$, SD $= 0.61$; old neighbourhood quality range -2.14 to $+0.82$, SD $= 0.54$). Due to the limited data available for these scores, the neighbourhood quality variables have only been included in the economic development and material security models (1 and 3).

2.3. Analysis

All data analysis was done in RStudio (v2023.06.1 + 524).The table below details what models were included, how they target our research questions and hypotheses, as well as whether they were preregistered. Model selection was theory-driven, with each model targeting hypotheses that were pre-registered. Any deviations from pre-registered hypotheses are described in Table 2. Models 1, 2, 3, 4, 5, 7 and 6 consist of

Table 2
Analysis plan and justification.

Models	Hypothesis	Preregistration	Justification
M1: Neighbourhood Quality M2: Household Material Security M3: Household and Neighbourhood Security	H1. High material security (measured throughpast and current neighbourhood quality, and current household material security) will predict lower participation in religion and lower belief.	Confirmatory	This hypothesis is derived from the existential insecurity hypothesis. Neighbourhood quality, and household material security contribute to different facets of an individual's sense of existential security, hence we look at the variables first on their own (M1 & M2), before looking at their combined effects.
M4: Education	H2. High formal education will predict lower participation in religion and lower belief.	Confirmatory, education importance variables are exploratory.	Secularisation theory and the existential insecurity hypotheses propose a different process for how formal education influences the secularisation process. As this differs from how material security impacts religiosity, we first test the effects of education separately from other material security variables.
M5: Religious Socialisation	H3. Low CREDs exposure will predict low belief and lower participation. H4. Religious schooling will not have a strong effect separate from CREDs.	Confirmatory.	H3 and H4 are derived from cultural evolutionary explanations of why religion persists. We look at the influence of exposure to costly displays (CREDs), one of the primary mechanism for the transmission of religious beliefs. This accounts for vertical transmission of religion within the family. The religious schooling variable measures other consistent forms of religious transmission in formal settings.
M6: Modernisation & CREDs	H5. Higher material security in childhood and adulthood will predict lower exposure to CREDs.	Confirmatory.	As higher security is hypothesised to decrease individuals' participation in religion, this suggests that individuals are also less likely to display costly religious displays - hence a lower exposure to CREDs. This hypothesis helps integrate the two theoretical accounts.
M7: Complete Model	H1, H2, H3, H4	Hypotheses preregistered; combined model not preregistered	This is an additive model which tests effects of all variables to integrate the two theoretical accounts. Here, we look at variables as independent contributors to the secularisation process.
M8: Interaction Model	H1, H2, H3, H4, H5	Hypotheses preregistered; interaction model not preregistered	This model helps us understand the interaction of ecological pressures and cultural evolutionary mechanisms. Looking at the interaction of CREDs and household security can inform a deeper understanding of how cultural transmission and material security shape each other's effect on religion.

sets of two regressions, one with religious belief as an outcome, and the second with religious practice. This was done as we expected different effects on religious belief vs practice. All models (1–7) control for age and gender, and include religious background as a random intercept to account for group differences. Neighbourhood quality variables were excluded from Models 6,7, and 8 due to missing data.

3. Results

3.1. Model 1: neighbourhood quality

We first look at the influence of both past and current neighbourhood quality through a linear mixed-effects model. The correlation between past and current neighbourhood quality is moderate ($r = 0.53$). Religious affiliation was included as a random intercept to account for variances due to religious upbringing. We found no significant effects of current neighbourhood quality ($\beta = 0.02$, 95% CI [−0.08, 0.11], $t(475) = 0.35$, $p = 0.729$), or past neighbourhood quality, ($\beta = -0.06$, 95% CI [−0.15, 0.04], $t(475) = -1.22$, $p = 0.222$), on participants' reported belief. Similarly, there were no significant effects of either current, ($\beta = 0.01$, 95% CI [−0.09, 0.11], $t(484) = 0.18$, $p = 0.859$), or past neighbourhood quality ($\beta = 0.01$, 95% CI [−0.09, 0.11], $t(484) = 0.22$, $p = 0.822$) on participants' reported religious practices.

3.2. Model 2: material security

The next two models (Table 3) look at the effects of household material security on religious belief and practice. Household material

Table 3
Material security models.

	Belief			Practice		
Predictors	Estimates	Std. Error	CI	Estimates	Std. Error	CI
Intercept	−0.03	0.27	−0.56–0.50	−0.14	0.12	−0.38–0.10
Age	0.02 ***	0.00	0.02–0.03	0.03 ***	0.00	0.02–0.03
Gender (Female)	0.28 ***	0.08	0.12–0.44	0.29 **	0.10	0.09–0.49
Household Material Security	−0.08	0.04	−0.17–0.01	−0.06	0.05	−0.16–0.04
Random Effects						
σ^2	1.31			2.02		
τ_{00}	0.21 $_{RelBackground}$			0.03 $_{RelBackground}$		
ICC	0.14			0.01		
N	3 $_{RelBackground}$			3 $_{RelBackground}$		
Observations	799			808		
Marginal R^2 / Conditional R^2	0.110 / 0.232			0.089 / 0.101		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

security has a negative but non-significant effect in the religious belief model (β = −0.09, 95% CI [−0.17, 0.01]) nor in the religious practice model (β = −0.06, 95% CI [−0.16, 0.04]).

3.3. Model 3: household and neighbourhood security

In the following models (Table 4), we look at the effects of both household material security and current neighbourhood quality. The correlation coefficient of these variables is 0.05. Neighbourhood quality has no effect on either belief or practice. Material security has a significant negative effect on belief (β = −0.12, 95% CI [−0.23,- 0.01]) while its effects on practice are low and non-significant (β = −0.07, 95% CI [−0.21, 0.06]). This suggests a general low negative effect of increasing material security on religious belief across all levels of neighbourhood quality.

3.4. Model 4: Education

We found a non-significant negative effect of years of formal education on both individual religious belief (β = −0.06, 95% CI [−0.13, 0.01], t(827) = −1.60, p = 0.111) and practice (β = −0.06, 95% CI [−0.13, 0.01], t(836) = −1.59, p = 0.112).

This model also includes two measures of attitudes towards education: how one's 1) religious community, and 2) family value formal education. The correlation between these two variables is 0.39. We initially looked at the effects of each of those variables separately. The family importance model finds positive effects of family valuation of education on both belief (non-significant) and practice (Table SM5). Community importance has significant positive effects on both belief and practice as well (Table SM6).

Education perceived as important by one's religious community (Community Importance) positively influences both belief (β = 0.29, 95% CI [0.22, 0.35]) and practice (β = 0.34, 95% CI [0.26, 0.42]). This suggests that across Mauritian religious communities, a positive view of formal education supports both religious belief and practice. However, education being perceived as important by the family (Family Importance) has a negative effect (β = −0.13, 95% CI [−0.24, −0.02]) on belief, but no significant effect on religious practice. The moderate correlation and divergent main effects of the importance of education variables suggest that these variables may be interacting in this larger model. Table 5 illustrates these results. Fig. 2 plots the effects of the attitude towards education variables on belief and practice for each of the 3 religious communities (estimated from separate models for each group).

3.5. Model 5: religious socialisation

We look at the effects of religious CREDs from the family and religious schooling on individual religious belief and practice. The results of this model are illustrated in Table 6. CREDs have a significant effects on both belief (β =0.23, 95% CI [0.15, 0.30]) and practice (β =0.58, 95% CI [0.50, 0.67]). Fig. 3 illustrates this effect for the three religious groups (separate models for each group). Religious schooling (binary variable) influences belief and practice in the predicted direction, although this is only significant for practice (β =0.41, 95% CI [0.11, 0.72]).

Table 4
Material security & neighbourhood quality model.

	Belief			Practice		
Predictors	Estimates	Std. Error	CI	Estimates	Std. Error	CI
Intercept	0.08	0.28	−0.47–0.62	−0.14	0.15	−0.42–0.15
Age	0.02 ***	0.00	0.02–0.03	0.03 ***	0.00	0.02–0.03
Gender (Female)	0.16	0.10	−0.03–0.36	0.22	0.13	−0.02–0.47
Household Material Security	−0.12 *	0.05	−0.23 to −0.01	−0.07	0.07	−0.21–0.06
Neighbourhood Quality (current)	−0.00	0.08	−0.16–0.15	0.08	0.10	−0.13–0.28
Random Effects						
σ^2	1.24			2.01		
τ_{00}	0.22 $_{RelBackground}$			0.04 $_{RelBackground}$		
ICC	0.15			0.02		
N	3 $_{RelBackground}$			3 $_{RelBackground}$		
Observations	525			532		
Marginal R^2 / Conditional R^2	0.113 / 0.244			0.083 / 0.100		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 5
Education models.

	Belief			Practice		
Predictors	Estimates	Std. Error	CI	Estimates	Std. Error	CI
Intercept	−0.03	0.23	−0.49–0.43	−0.10	0.07	−0.23–0.04
Age	0.02 ***	0.00	0.02–0.03	0.02 ***	0.00	0.01–0.03
Gender (Female)	0.24 **	0.08	0.09–0.39	0.21 *	0.10	0.02–0.40
Education Level	−0.02	0.01	−0.05–0.01	−0.03	0.02	−0.06–0.00
Family Importance	−0.13 *	0.06	−0.24 to −0.02	0.03	0.07	−0.11–0.16
Community Importance	0.29 ***	0.03	0.22–0.35	0.34 ***	0.04	0.26–0.42
Random Effects						
σ^2	1.21			1.84		
τ_{00}	0.16 $_{RelBackground}$			0.00 $_{RelBackground}$		
ICC	0.11					
N	3 $_{RelBackground}$			3 $_{RelBackground}$		
Observations	823			829		
Marginal R^2 / Conditional R^2	0.188 / 0.281			0.177 / NA		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

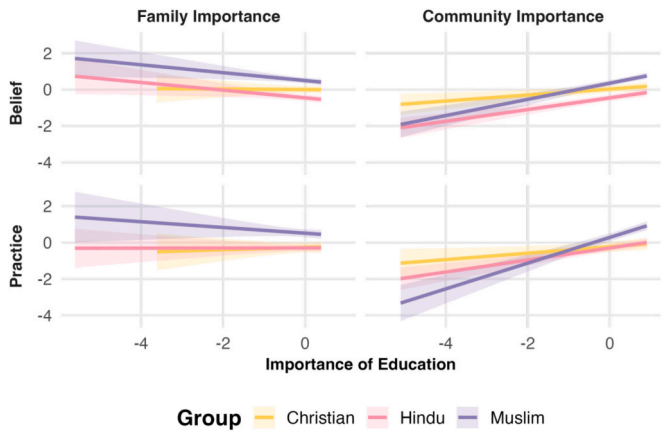

Fig. 2. Effects of family and community importance of education.

3.6. Model 6: modernisation & CREDs

This model (Table 7) explores the effects of the existential insecurity variables on individual exposure to CREDs. We include only household material wealth as a measure of economic security due to limited data points for neighbourhood quality. This model tests how modernisation may be changing the religious norms on the island. Counter to our hypothesis, household wealth has a significant positive effect on CREDs (β = 0.12, 95% CI [0.03, 0.20]). Fig. 4 shows these effects when looking separately at the Christian, Hindu, and Muslim communities. Importance of education to family (β = 0.23, 95% CI [0.11, 0.34]) and the community (β = 0.09, 95% CI [0.02, 0.16]) both positively influence perceived CREDs.

3.7. Model 7: additive model

Here, we examine the effects of household material security, education, and religious socialisation variables on individual religious belief and practice together in one model (Table 8). This helps us test how the theories of existential security and religious socialisation together explain variance in religiosity. In these models, household material security has no significant effect on religious belief (β = −0.05, 95% CI [−0.14, 0.04]) or practice (β = −0.08, 95% CI [−0.18, 0.02]). We find no effect of education level on religious belief or practice while the importance of religion variables have significant effects in both models. While education being important to the family (Family Importance) negatively influences belief (β = −0.25, 95% CI [−0.37, −0.14]) and practice (β = −0.18, 95% CI [−0.32, −0.05]), its importance to the community (Community Importance) does the reverse to belief (β = 0.28, 95% CI [0.21, 0.35])and practice (β = 0.29, 95% CI [0.20, 0.37]). The fixed effects in the belief model accounts for 24% of the variance and those in the practice model account for 34%. Random effects suggest that religious background accounts for 5.2% of the variance in belief and 1.8% in practice. The supplementary material includes versions of this model looking at these effects separately for each religious group (Tables S8a-c) and when marital status is included (Table S10).

Table 6
Religious socialisation models.

	Belief			Practice		
Predictors	Estimates	Std. Error	CI	Estimates	Std. Error	CI
Intercept	−0.25	0.23	−0.70–0.20	−0.47 *	0.21	−0.88 to −0.07
Age	0.02 ***	0.00	0.02–0.03	0.02 ***	0.00	0.01–0.03
Gender (Female)	0.24 **	0.08	0.07–0.40	0.16	0.10	−0.03–0.35
CREDs	0.23 ***	0.04	0.15–0.30	0.58 ***	0.04	0.50–0.67
Religious Schooling (Present)	0.25	0.13	−0.01–0.51	0.41 **	0.16	0.11–0.72
Random Effects						
σ^2	1.10			1.49		
τ_{00}	0.11 $_{RelBackground}$			0.06 $_{RelBackground}$		
ICC	0.09			0.04		
N	3 $_{RelBackground}$			3 $_{RelBackground}$		
Observations	673			678		
Marginal R^2 / Conditional R^2	0.182 / 0.256			0.314 / 0.341		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

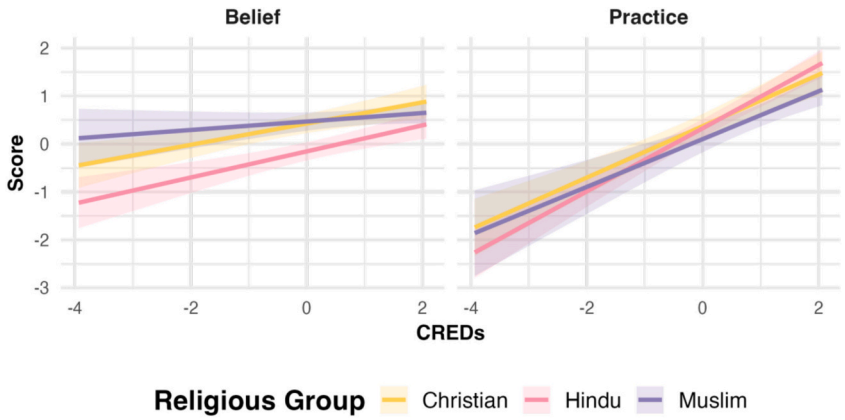

Fig. 3. Effects of CREDs.

Table 7
Existential security - religious CREDs model.*

	CREDs		
Predictors	Estimates	Std. Error	CI
Intercept	0.04	0.33	−0.60–0.68
Age	0.01 **	0.00	0.00–0.01
Gender (Female)	0.04	0.08	−0.11–0.20
Education Level	−0.02	0.01	−0.05–0.01
Family Importance	0.23 ***	0.06	0.11–0.34
Community Importance	0.09 **	0.04	0.02–0.16
Household Material Security	0.12 **	0.04	0.03–0.20
Random Effects			
σ^2	1.21		
$\tau_{00\ RelBackground}$	0.31		
ICC	0.20		
$N_{\ RelBackground}$	3		
Observations	781		
Marginal R^2 / Conditional R^2	0.060 / 0.250		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

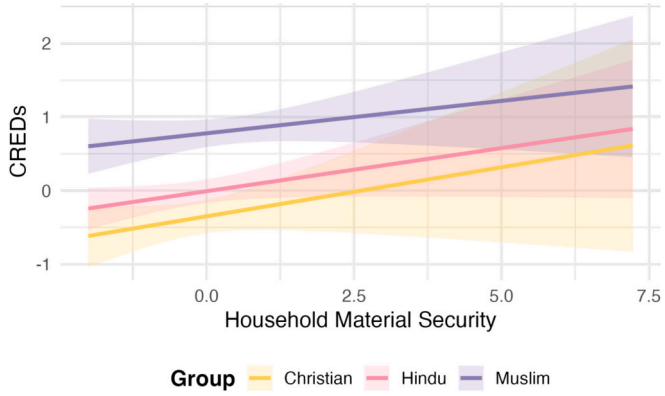

Fig. 4. Effect of household material security on CREDs.

3.8. Model 8: interaction model

The positive effect of wealth on CREDs exposure in Model 6, above, suggests that there may be an interaction between these two variables. To better understand the effects of material security and CREDs exposure on individual religious belief and practice, we have included an additional analysis with the interaction effect of household material security and CREDs (Table 9). In this model, the main effect of household wealth on belief remains insignificant(β = −0.06, 95% CI [−0.16, 0.03]). However, we find a significant negative main effect of wealth on religious practice (β = −0.12, 95% CI [−0.23, −0.02]). The positive effect of wealth on CREDs exposure in Model 6, above, suggests that there may be an interaction between these two variables. To better understand the effects of material security and CREDs exposure on individual religious belief and practice, we have included an additional analysis with the interaction effect of household material security and CREDs (Table 8). In this model, the main effect of household wealth on belief remains non-significant (β = −0.06, 95% CI [−0.16, 0.03]). However, we find a significant negative main effect of wealth on religious practice (β = −0.12, 95% CI [−0.23, −0.02]). Additionally, we find a positive interaction effect of household wealth and CREDs on religious practice (β = 0.10, 95% CI [0.02, 0.17]). Fig. 5 illustrates how the impact of CREDs varies at different levels of material security: religious belief and practice is more likely to be maintained at all levels of CREDs exposure among those with lower material security. As material security increases, belief and practice decline when CREDs are low, but remain stable at high levels of CREDs. This pattern holds when we look at the individual slopes for religious groups, but the effects are most pronounced among Hindus (see supplemental Fig. S2). A Johnson-Neyman test suggests that the negative association of material security with religious practice is only significant at low levels of CREDs (<0.23, see Fig. S3a, S3b).

Looking at these effects separately for each religious community (Table S9a-c, Fig. S2,), we find that this pattern holds when we look at the individual slopes for religious groups, but the effects are most pronounced among Hindus.

4. Discussion

This paper tests how existential insecurity and religious socialisation work together to explain religious change in Mauritius. This population allows us to test these theories in the early stages of religious decline, among three communities, Christians, Hindus, and Muslims. Our results provide nuanced support for the existential insecurity hypothesis in a somewhat different way than we hypothesised, and more robust evidence for religious socialisation processes contributing to the stability of religion.The next sections discuss these findings in more detail.

4.1. Existential insecurity models

We hypothesised, in line with the existential security hypothesis, that higher levels of material security and education would predict lower levels of belief in God and religious practice. We proposed that this effect might be due to the impact of security on religious socialisation with higher existential security leading to lower engagement with religion and thus lower credibility enhancing displays (CREDs). We included two measures of material security: neighbourhood quality and household

Table 8
Additive models.

	Belief			Practice		
Predictors	Estimates	Std. Error	CI	Estimates	Std. Error	CI
Intercept	−0.16	0.22	−0.59–0.27	−0.33	0.21	−0.73–0.07
Age	0.02 ***	0.00	0.01–0.02	0.01 ***	0.00	0.01–0.02
Gender (Female)	0.22 **	0.08	0.06–0.38	0.14	0.10	−0.05–0.33
Education Level	−0.01	0.02	−0.04–0.02	−0.01	0.02	−0.05–0.02
Family Importance	−0.25 ***	0.06	−0.37 to −0.14	−0.18 **	0.07	−0.32 to −0.05
Community Importance	0.28 ***	0.04	0.21–0.35	0.29 ***	0.04	0.20–0.37
Household Material Security	-0.05	0.05	−0.14–0.04	−0.08	0.05	−0.18–0.02
CREDs	0.23 ***	0.04	0.15–0.30	0.57 ***	0.04	0.48–0.65
Religious Schooling (Present)	0.16	0.13	−0.10–0.43	0.27	0.15	−0.04–0.57
Random Effects						
σ^2	1.01			1.35		
τ_{00}	0.09 $_{RelBackground}$			0.06 $_{RelBackground}$		
ICC	0.08			0.04		
N	3 $_{RelBackground}$			3 $_{RelBackground}$		
Observations	632			635		
Marginal R^2 / Conditional R^2	0.255 / 0.318			0.367 / 0.394		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 9
Interaction models.

	Belief			Practice		
Predictors	Estimates	Std. Error	CI	Estimates	Std. Error	CI
Intercept	−0.17	0.22	−0.59–0.26	−0.34	0.21	−0.74–0.06
Age	0.02 ***	0.00	0.01–0.02	0.01 ***	0.00	0.01–0.02
Gender (Female)	0.22 **	0.08	0.06–0.38	0.14	0.10	−0.05–0.33
Education Level	−0.01	0.02	−0.04–0.02	−0.01	0.02	−0.04–0.02
Family Importance	−0.25 ***	0.06	−0.37 to −0.13	−0.17 *	0.07	−0.31 to −0.04
Community Importance	0.27 ***	0.04	0.20–0.35	0.28 ***	0.04	0.20–0.36
Household Material Security	−0.06	0.05	−0.16–0.03	−0.12 *	0.05	−0.23 to −0.02
CREDs	0.23 ***	0.04	0.15–0.30	0.56 ***	0.04	0.48–0.65
Religious Schooling (Present)	0.17	0.13	−0.09–0.43	0.27	0.15	−0.03–0.57
Material Security:CREDs	0.04	0.03	−0.03–0.10	0.10 *	0.04	0.02–0.17
Random Effects						
σ^2	1.01			1.34		
τ_{00}	0.09 $_{RelBackground}$			0.06 $_{RelBackground}$		
ICC	0.08			0.04		
N	3 $_{RelBackground}$			3 $_{RelBackground}$		
Observations	632			635		
Marginal R^2 / Conditional R^2	0.256 / 0.318			0.373 / 0.399		

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

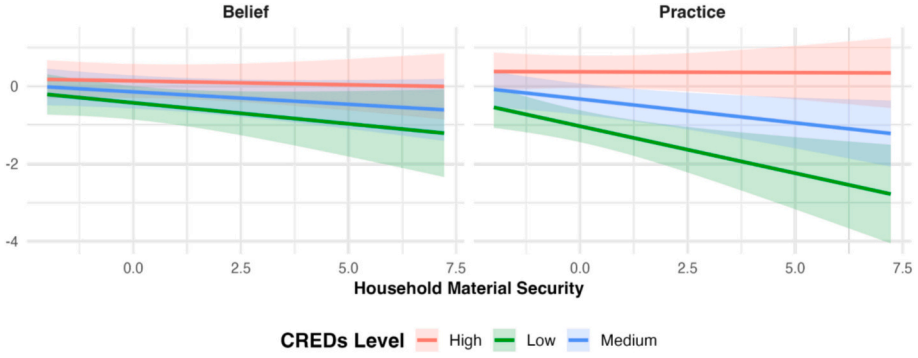

Fig. 5. Interaction of household material security and CREDs.

material security. We found no effect of neighbourhood quality on individual belief or practice. Household material security had weak and unreliable negative effects on belief and practice, which only reached significance and only for belief when neighbourhood quality was included in the model. Contrary to our hypothesis, household wealth had a significant positive effect on individual's exposure to religious displays (CREDs). This suggests that as household wealth increases, families are performing *more* credible actions that signal their religious

beliefs. Other work in Mauritius has suggested similar in Tamil Hindu populations, with wealthier individuals using more elaborate and expensive offerings in religious festivals (Xygalatas et al., 2021). It is possible that though these displays are bigger, they are seen as less credible, since they are relatively easier for wealthier households. This possibility is ripe for future research. This is somewhat supported by our finding that variability in CREDs is much more important for those with the highest levels of household wealth.

Research examining the existential insecurity hypothesis has found conflicting findings which are replicated within this study. Existential insecurity is not measured in consistent ways: several researchers focused on country level indicators such as GDP, and social welfare and poverty indicators (Kusano and Jami, 2022; Lang and Chvaja, 2024; Norris and Inglehart, 2011). Willard and Cingl (2017) who look at secularisation at the individual level, use measures of both individual perception of various forms of insecurity and objective measures from people's local communities. They found small positive effects of physical insecurity, and local unemployment rate on religious practice - but not belief in god. If these previous findings were to be replicated in Mauritius, where social welfare facilities are abundant, we should also expect a decline in religious practice associated with neighbourhood quality across the various communities. We did not find any effects here. Our study suggests that: at the individual level, the effect of household material security differed based on what else was included in the model, making conclusions here difficult, even though they were consistently in the predicted direction. The use of such diverse measures of security makes these findings hard to directly compare, but may also point to cultural differences. Other diverse samples need to be sought for a more comprehensive understanding of these effects.

The education model (model 4) suggests no reliable effect of years of formal education on individual belief and practice. Despite the widespread patterns of declining religiosity alongside increases to education (Hungerman, 2014; Schwadel, 2015, 2016; Vardy et al., 2022), other researchers have also found more nuance in this relationship. For instance, Purzycki and Bendixen (2024) find that across countries outside of the Global North, including Mauritius and others at varying levels of market integration, there is little reliable evidence that formal education influences religious commitment as predicted by secularisation theories. Our study replicates these findings as we find no significant link between formal education and religiosity.

The attitude towards education variables have significant effects on both individual religiosity and exposure to religious CREDs. Education being valued by one's religious community has *positive* effects on individuals' extent of religious belief and practice. However, extra emphasis on education from one's family negatively influences individual belief. This effect is not consequential for individual religious practice. Simultaneously, when one's family and community emphasise education, individuals report higher exposure to religious CREDs.

These results suggest that education and religion may function as complementary commitments within Mauritius. Formal education does not have a strong impact on individuals' supernatural beliefs and practices, but the norms around religious and secular educational structures do seem to be important. Hence, the positive attitude of religious communities towards education may function as a protective factor against the loss of religious practices. These results contribute to a more nuanced understanding of how modernisation processes may influence religious changes. The impact of the importance of education to the family is harder to interpret here, and more research may be needed to untangle these effects.

Strong secularisation theory has been criticised for the reductionist view where the end goal is the absence of religion (Pollack, 2015). By focusing on secularisation as the final outcome of modernisation processes, we overlook how religion itself is subject to other forms of change, as well as how it influences, and is influenced by other social structures and areas of human experienceswith which religion is interlinked. From empirical research, we know that there is more nuance in how modernisation processes across cultures influence religion (Purzycki and Bendixen, 2024): modernisation may influence the form of practice (Baimel et al., 2022; Xygalatas and Maño, 2024) instead of the extent of one's belief. In this study, material security and positive attitudes towards education, which are indicative of higher status, predict higher religious socialisation in the home. This suggests that religious practices and social status are intertwined in Mauritian society beyond the relationship typically proposed by secularisation theories. Since existential insecurity hypothesis primarily focuses on the material and physical forms of security that comes with modernisation, it may be overlooking other sources of discomfort that emerge in the modern world that encourage humans to turn towards the supernatural and how religious beliefs might adapt and change to new circumstances.

4.2. *Cultural evolution model: religious socialisation and security*

In line with previous findings, we proposed that exposure to credibility enhancing displays would act as protective factors against the loss of religion, predicting higher individual religious belief and practice. We find a positive effect on belief and religious practice across our models, confirming this hypothesis. Similar to previous findings (Willard and Cingl, 2017) the larger effect on practice suggests that CREDS may be more influential on individual behaviours than beliefs. Religious schooling, which is common across religious communities in the Mauritian context, has a positive effect separate from CREDs, but only on religious practice and counter to our hypothesis. These findings align with both theoretical accounts of the role of cultural transmission of religiosity through exposure to credibility enhancing displays.

Our last sets of models (7 and 8) aim to test the effects of existential insecurity and religious socialisation in tandem. Model 7 is an additive model where the effects of all variables do not largely differ from effects in the separate models: the effects of years of formal education and household wealth are not significant. The importance of education variables, CREDs, and religious schooling account for most of the variance in both individual religious belief and practice.

Due to the unexpected positive effect of household wealth on CREDs (model 6), we include model 8 to capture potential interactions of household wealth on CREDs, which may influence individual religiosity. The effects of CREDs hold for both belief and practice, further supporting the cultural evolutionary framework. The effect of material security remains inconsequential for belief. However, we find a significant negative effect of household wealth on practice, suggesting that religious behaviours are more affected by increased access to material security when levels of CREDs are accounted for. The interaction of household wealth and CREDs suggest that material security influences the effects of CREDs: CREDs have a much larger effect at high levels of material security than at lower levels, hence sustaining religiosity in conditions where they are hypothesised to decline. At low levels of security, the smaller effects of CREDs on both belief and practice suggest that religion may be protective against existential pressures at low security, as suggested by the existential security hypothesis. This relationship is only significant for religious practice, but not belief - this may be because we are looking at the early stages of secularisation and often behaviours are faster to change that beliefs (Bicchieri, 2016; Bicchieri and Mercier, 2014).

5. Conclusion

This study gives a broad overview of how modernisation and cultural transmission processes may be changing the religious landscape of Mauritius, however there is still more to tease apart for a deeper understanding of this process of change. Research using more longitudinal methods could help elucidate the trajectories of religiosity across the individual lifespan. This could further account for whether the variance in religiosity results from generational differences in modernisation pressures and cultural processes, or lifecourse fluctuations in religiosity.

The benefit of looking at these processes in more diverse samples with diverse religious backgrounds cannot be overstated. If increased security is leading to lower religious belief and practice broadly across human culture, then the world is full of cultures at various stages of this process that can help us gain a more complete understanding of these processes of cultural change.

CRediT authorship contribution statement

Nachita Rosun: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Matthew M. Gervais:** Project administration, Funding acquisition. **Aiyana K. Willard:** Writing – review & editing, Supervision, Project administration, Methodology, Data curation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This project was funded by grant 61928 from the John Templeton Foundation awarded to Matthew M Gervais (PI), Aiyana K Willard (Co-I), and Nachita Rosun (Co-I).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.evolhumbehav.2026.106832.

References

Baimel, A., Apicella, C., Atkinson, Q., Bolyanatz, A., Cohen, E., Handley, C., … Purzycki, B. (2022). Material insecurity predicts greater commitment to moralistic and less commitment to local deities: A cross-cultural investigation. *Religion, Brain & Behavior, 12*(1–2), 4–17. https://doi.org/10.1080/2153599X.2021.2006287

Bengtson, V. L. (2013). *Families and faith: How religion is passed down across generations.* Oxford University Press.

Berger, P. L. (1967). *The sacred canopy: Elements of a sociological theory of religion.* Doubleday.

Bicchieri, C. (2016). *Norms in the wild: How to diagnose, measure, and change social norms.* Oxford University Press.

Bicchieri, C., & Mercier, H. (2014). Norms and beliefs: How change occurs. In *The complexity of social norms* (pp. 37–54). Cham: Springer International Publishing.

Braun, C. M. (2012). Explaining global secularity: Existential security or education? *Secularism and Nonreligion, 1*, 68–93.

Bruce, S. (2002). *God is dead: Secularization in the west* (Vol. 3). Oxford: Blackwell.

Bruce, S. (2011). Secularization. In *Defence of an unfashionable theory*. Oxford University Press. https://doi.org/10.1093/acprof:osobl/9780199654123.001.0001.

Bruce, S. (2017). *Secular beats spiritual.* Oxford University Press.

Durkheim, É. (1912). *Les formes élémentaires de la vie religieuse*. Alcan.

Finke, R., & Stark, R. (2005). *The churching of America, 1776-2005: Winners and losers in our religious economy*. Rutgers University Press.

Gervais, W. M., & Najle, M. B. (2015). Learned faith: The influences of evolved cultural learning mechanisms on belief in gods. *Psychology of Religion and Spirituality, 7*(4), 327–335. https://doi.org/10.1037/rel0000044

Gervais, W. M., Willard, A. K., Norenzayan, A., & Henrich, J. (2011). The cultural transmission of faith: Why innate intuitions are necessary, but insufficient, to explain religious belief. *Religion, 41*, 389–410. https://doi.org/10.1080/0048721X.2011.604510

Gervais, W. M., Najle, M. B., & Caluori, N. (2021). The origins of religious disbelief: A dual inheritance approach. *Social Psychological and Personality Science, 12*(7), 1369–1379. https://doi.org/10.1177/1948550621994001

Henrich, J. (2009). The evolution of costly displays, cooperation and religion: Credibility enhancing displays and their implications for cultural evolution. *Evolution and Human Behavior, 30*(4), 244–260.

Henrich, J. (2015). Markets, religion, community size and the evolution of fairness and punishment. *The Behavioral and Brain Sciences, 7*, 595.

Henrich, J., Bauer, M., Cassar, A., et al. (2019). War increases religiosity. *Nature Human Behaviour, 3*, 129–135. https://doi.org/10.1038/s41562-018-0512-3.

Hirschle, J. (2013). "Secularization of consciousness" or alternative opportunities? The impact of economic growth on religious belief and practice in 13 European countries. *Journal for the Scientific Study of Religion, 52*(2), 410–424. https://doi.org/10.1111/jssr.12030

Hong, Z., Slingerland, E., & Henrich, J. (2024). Magic and empiricism in early Chinese rainmaking: A cultural evolutionary analysis. *Current Anthropology, 65*(2), 343–363.

Hungerman, D. M. (2014). The effect of education on religion: Evidence from compulsory schooling laws. *Journal of Economic Behavior & Organization, 104*, 52–63.

Inglehart, R. F. (2020). *Religion's sudden decline: What's causing it, and what comes next?*. Oxford University Press.

Ishii, T., & Watanabe, K. (2024). Cultural transmission and religious belief: An extended replication of Gervais and Najle (2015) using data from the international social survey programme. *PLoS One, 19*(6), Article e0305635.

Kasselstrand, I., Zuckerman, P., & Cragun, R. T. (2023). *Beyond doubt: The secularization of society* (Vol. 7). NYU Press.

Kusano, K., & Jami, W. A. (2022). Selected anomalies or overlooked variability? Modernization is associated with secularization in countries with high historical wealth but is associated with increasing religiosity in post-communist or Christian-minority countries. *Current Research in Ecological and Social Psychology, 3*, Article 100036.

Lang, M., & Chvaja, R. (2024). Mechanisms of secularization: Testing between the rationalization and existential insecurity theories. *Collabra Psychology, 10*(1), Article 126508.

Lanman, J. A., & Buhrmester, M. D. (2017). *Religious actions speak louder than words: Exposure to credibility*.

Łowicki, P., & Zajenkowski, M. (2020). Empathy and exposure to credible religious acts during childhood independently predict religiosity. *The International Journal for the Psychology of Religion, 30*(2), 128–141.

Maij, D. L., van Harreveld, F., Gervais, W., Schrag, Y., Mohr, C., & van Elk, M. (2017). Mentalizing skills do not differentiate believers from non-believers, but credibility enhancing displays do. *PLoS One, 12*(8), Article e0182764.

Mano, P., & Xygalatas, D. (2022). Ritual form and ritual choice among Mauritian Hindus. *Slovak Ethnology*. https://doi.org/10.61577/SN.2022.2.18

Marx, K. (1843). *Contribution to the critique of Hegel's philosophy of right. Introduction*.

Mesoudi, A. (2021). Cultural selection and biased transformation: Two dynamics of cultural evolution. *Philosophical Transactions of the Royal Society B, 376*(1828), Article 20200053.

Ng Tseung-Wong, C., & Verkuyten, M. (2014). "I'd rather we be neighbours than lovers": The two-sidedness of multiculturalism. *Group Processes & Intergroup Relations, 18*(4), 437–453. https://doi.org/10.1177/1368430214546068 (Original work published 2015)

Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., & Henrich, J. (2016). The cultural evolution of prosocial religions. *Behavioral and Brain Sciences, 39*, Article e1. https://doi.org/10.1017/S0140525X14001356

Norris, P., & Inglehart, R. (2011). *Sacred and secular: Religion and politics worldwide.* Cambridge University Press.

Pew Research Center. (2016). *Religion in everyday life*. Pew Research Center. https://www.pewresearch.org/religion/2016/04/12/religion-in-everyday-life/.

Pew Research Center. (2022). *Key findings from the global religious futures project.* Pew Research Center. https://www.pewresearch.org/religion/2022/12/21/key-findings-from-the-global-religious-futures-project/.

Pollack, D. (2015). Varieties of secularization theories and their indispensable core. *The Germanic Review: Literature, Culture, Theory, 90*(1), 60–79.

Purzycki, B. G. (2011). Tyvan cher eezi and the socioecological constraints of supernatural agents' minds. *Religion, Brain & Behavior, 1*(1), 31–45. https://doi.org/10.1080/2153599X.2010.550723

Purzycki, B. G. (2013). Toward a cognitive ecology of religious concepts: An example from the Tyva Republic. *Journal for the Cognitive Science of Religion, 1*(1), 99–120.

Purzycki, B. G., Ross, C. T., Apicella, C., Atkinson, Q. D., Cohen, E., McNamara, R. A., … Henrich, J. (2018). Material security, life history, and moralistic religions: A cross-cultural examination. *PloS one, 13*(3), Article e0193856.

Purzycki, B. G., & Bendixen, T. (2024). Material insecurity and religiosity: A causal analysis. *Evolutionary Human Sciences, 6*, Article e4. https://doi.org/10.1017/ehs.2023.29

Purzycki, B. G., & Sosis, R. (2022). *Religion evolving: Cultural, cognitive, and ecological dynamics*. https://doi.org/10.1558/isbn.9781800500532

Richerson, P. J., & Boyd, R. (2004). *Not by genes alone: How culture transformed human evolution.* University of Chicago Press.

Schwadel, P. (2015). Explaining cross-national variation in the effect of higher education on religiosity. *Journal for the Scientific Study of Religion, 54*(2), 402–418.

Schwadel, P. (2016). Does higher education cause religious decline? A longitudinal analysis of the within-and between-person effects of higher education on religiosity. *The Sociological Quarterly, 57*(4), 759–786.

Sibley, C. G., & Bulbulia, J. (2012). Faith after an earthquake: A longitudinal study of religion and perceived health before and after the 2011 Christchurch New Zealand earthquake. *PLoS One, 7*(12), Article e49648.

Singh, M., Kaptchuk, T. J., & Henrich, J. (2021). Small gods, rituals, and cooperation: The Mentawai water spirit Sikameinan. *Evolution and Human Behavior, 42*(1), 61–72.

Stark, R. (1999). Secularization, R.I.P. *Sociology of Religion, 60*(3), 249–273. https://doi.org/10.2307/3711936

Statistics Mauritius. (1990). *Housing and population census*. https://statsmauritius.govmu.org/Documents/Census_and_Surveys/Archive%20Census/1990%20Census/Table%20Reports/1990%20HPC%20Vol.%20II.pdf.

Statistics Mauritius. (2022). *Housing and population census*. https://statsmauritius.govmu.org/Documents/Census_and_Surveys/Census2022/HPC_TR_Vol2_Demography_Yr22.pdf.

Storm, I. (2017). Does economic insecurity predict religiosity? Evidence from the European social survey 2002–2014. *Sociology of Religion, 78*(2), 146–172.
Strhan, A., & Shillitoe, R. (2019). The stickiness of non-religion? Intergenerational transmission and the formation of non-religious identities in childhood. *Sociology, 53*(6), 1094–1110. https://doi.org/10.1177/0038038519855307 (Original work published 2019)
Turpin, H. (2022). Unholy Catholic Ireland: Religious hypocrisy, secular morality, and Irish irreligion. In *Unholy Catholic Ireland*. Stanford University Press.
Turpin, H. D., & Willard, A. K. (2022). Credibility enhancing displays, religious scandal and the decline of Irish Catholic orthodoxy. *Evolutionary Human Sciences, 4*, Article e20.
Turpin, H., Andersen, M., & Lanman, J. A. (2019). CREDs, CRUDs, and Catholic scandals: Experimentally examining the effects of religious paragon behavior on co-religionist belief. *Religion, Brain & Behavior, 9*(2), 143–155.
UNDP. (2024). *Human development report*. United Nations Development Programme.
Vardy, T., Moya, C., Placek, C. D., Apicella, C. L., Bolyanatz, A., Cohen, E., … Atkinson, Q. D. (2022). The religiosity gender gap in 14 diverse societies. *Religion, Brain & Behavior, 12*(1–2), 18–37. https://doi.org/10.1080/2153599X.2021.2006292
Voas, D., & Storm, I. (2021). National context, parental socialization, and the varying relationship between religious belief and practice. *Journal for the Scientific Study of Religion, 60*(1), 189–197.
Weber, M. (1946). *From max Weber: Essays in sociology*. Oxford University Press.
Willard, A. K., & Cingl, L. (2017). Testing theories of secularization and religious belief in the Czech Republic and Slovakia. *Evolution and Human Behavior, 38*(5), 604–615.
Willard, A. K., Rosun, N., Lesage, K., Horský, J., & Xygalatas, D. (2024 Dec). Witchcraft, envy, and norm enforcement in Mauritius. *Hum Nat., 35*(4), 347–381. https://doi.org/10.1007/s12110-024-09484-4. Epub 2025 Jan 22. PMID: 39841375; PMCID: PMC11836218.
Xygalatas, D., & Maňo, P. (2024). Socioeconomic variation in motivations for ritual practice. *Religions, 15*(12), 1562.
Xygalatas, D., Klocová, E. K., Cigán, J., Kundt, R., Maňo, P., Kotherová, S., … Kanovsky, M. (2016). Location, location, location: Effects of cross-religious primes on prosocial behavior. *The International Journal for the Psychology of Religion, 26*(4), 304–319. https://doi.org/10.1080/10508619.2015.1097287
Xygalatas, D., Maňo, P., Bahna, V., Klocová, E. K., Kundt, R., Lang, M., & Shaver, J. H. (2021a). Social inequality and signaling in a costly ritual. *Evolution and Human Behavior, 42*(6), 524–533.